flood water being greater than is required at high floods and deficient in low floods and in summer, a system of dams at different parts of the river has been carried out for storing and regulating the supply.

The principal crops grown along the Nile are wheat, sugar, cotton, rice, maize, and other smaller vegetation. Where the supply of water is sufficient, two crops can be obtained in one year. The cultivation of cotton is rapidly extending, the value of this crop alone now being nearly as great as the whole revenue of the country.

The first great work for improving the irrigation undertaken by the Works Department after the British obtained control in 1883 was the completion of the great barrage, or dam, at the head of the Delta. This had been constructed by the French engineers for the purpose of holding up the Nile water to a height of 15 feet, sufficient to provide the necessary head for feeding the irrigation canals. Owing, however, to defects in the construction, it had never been possible to raise the level more than 5 feet. Under the direction of Colonel Scott-Moncrieff, the foundations were strengthened, and other necessary repairs carried out, with the result that the full head of water can now be maintained, and the land can be efficiently irrigated. Also, by the construction of another barrage, at a cost of 230,000*l.*, half-way between Cairo and the sea, the irrigation is rendered still more effective. Owing to these works the value of the cotton crop has been increased from 7½ to 15 millions of pounds, and the cultivated area increased by a million acres.

For regulating the supply of water in Upper Egypt, about seven years ago the great barrages, or dams, at Assouan and Assiout were built across the river at the head of the cultivated system of Upper Egypt. These works were carried out by the firm of Aird and Co. for the English Irrigation Department, the contract price being 2,000,000*l.* These dams act as regulators of the water supply in summer, and have practically doubled the supply available. It was stated by Lord Cromer, in one of his reports soon after they were completed, that the effect of these works was to increase the rental of the land to 3*l.* an acre, in addition to a tax of 10*s.* that is levied to pay the cost. A practical demonstration of their value was afforded in 1902, when the Nile flood was a very poor one, and the agricultural outlook was very critical, for a large area of cropping was in danger of being entirely lost through want of irrigation. This, however, was prevented, owing to the water stored by the dam at Assiout, and cropping estimated of the value of 500,000*l.* was saved. Thus the whole cost of this dam was paid for in this one season.

The dam recently opened by the Khedive is near Esneh, a town of 25,000 inhabitants, situated on the Nile 643 miles from the Mediterranean and 110 miles below the dam at Assouan. It has been constructed for the purpose of storing the flood water and providing perennial irrigation to a tract of land containing 250,000 acres, on which at present only one crop of cereals can be grown. When irrigated this land will be capable also of growing a second, or summer, and more profitable crop of sugar or cotton.

The dam is somewhat similar in construction to those above described. It consists of a masonry structure containing 119 piers, spaced 16½ feet apart, and connected by arches, on which is carried a roadway across the Nile about half a mile long and 19½ feet wide. The openings between the piers are fitted with upper and lower doors, or gates, resting in grooves, which can be raised or lowered by machinery so as to regulate the discharge of the water through the dam. For the use of the navigation a lock has been provided which is 262½ feet long and 52½ feet wide.

The dam at Assouan rested on the granite bed of the river, but at Esneh the substratum was sand, which extended to a considerable depth below the bed of the river. To carry the structure, therefore, a continuous floor had to be made 2950 feet long and 98½ feet wide. This floor consists of cement concrete 3½ feet thick, on which is 6½ feet of rubble masonry laid in cement and paved with granite setts. To prevent the water finding its way under this floor, when it is held up, two rows of iron sheet piles were driven to a depth of 13 feet below it, 61½ feet apart, across the bed of the river, the space between being filled with clay puddle pitched with limestone. On the down-stream side, to prevent erosion of the river bed by the water pouring through the arches when the doors are open, a floor was laid with a pitching of limestone 131 feet wide.

The superstructure was built of sandstone, granite being used for the lock. This sandstone was obtained from a quarry fifty-seven miles distant, the quantity used amounting to 166,000 cubic yards. The granite, of which 80,000 cubic yards was used, was brought down the Nile in barges from Assouan, a distance of 110 miles. The cement, the iron piles, and the machinery all came from England.

From 8000 to 10,000 natives were employed, Italians being engaged in preparing the stone. The work was supervised by English foremen and overseers.

The preliminary works, including the opening out of the quarries, temporary railways, of which twenty-four miles were used, workshops for the men, and offices, were commenced in the spring of 1906, the permanent work being begun in the following November. Three years were allowed by the contract, and as the work was completed in half the specified time, the district is thus given the benefit of an extra season's irrigation.

The works were designed by Mr. Webb, the engineer of the Egyptian Works Department, under the direction of Mr. Macdonald, the director of reservoirs, and carried out by Messrs. Aird and Co., the same contractors who constructed the Assouan and Assiout dams. The cost was more than 1,000,000*l.*

ELECTROCHEMICAL INDUSTRY.

THE report referred to below[1] is based in the main on information obtained during visits to certain countries in Europe and to the United States and Canada, including British Columbia. The Gartside scholarships were established in 1902 by Mr. J. H. Gartside, and are administered by the University of Manchester. The scholar who obtains the grant must first study in the university, and the remainder of his time must be devoted to an examination of subjects bearing upon commerce or industry in Germany, Switzerland, or the United States of America. It is intended that each scholar shall select some industry or business for examination, and investigate this comparatively in the United Kingdom and abroad.

The report is of particular interest because it deals with a subject which is of comparatively recent growth, and which has remarkable potentialities. In fact, as the author says, few chemical processes have escaped being affected in a greater or less degree by the application of electrical methods.

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[1] "Some Electrochemical Centres." By J. N. Pring. Being No. 7 of the Gartside Reports on Industry and Commerce. Pp. xiii+137. (Manchester: University Press, 1908.) Price 1*s.* 6*d.* net.

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But in this country no revolution has been caused in the chemical industry by the introduction of electrochemical methods. Of course, there are various reasons for this; in the first place, cheap power is a *sine qua non* if an electrochemical process is to be satisfactory. Although we have cheap coal, we have very limited supplies of water power. The heavy chemical industry of this country was also in a very secure and flourishing state, therefore there was not much inducement to try the newer methods. On the contrary, in America the chemical industries were not particularly well established. The water power obtainable from the Niagara is immense, although in this connection it should be borne in mind that nearly all the large electrolytic copper refineries are situated near New York, and are worked by steam power; and the progress in America is due in no small measure to the great enterprise and *superior technical training* of the people.

The first part of the volume discusses the question of cost of power production, comparisons being made between water, steam, oil-engine and gas-engine power. It appears in general that water power is the most economical, and gas engines actuated with blast-furnace gas the next. Chapter ii. deals with the Niagara Falls and the distribution of the power, the chief industries being the Aluminium Co. of America, Carborundum Co., Union Carbide Co., Castner Kellner Electrolytic Alkali Co., Oldbury Electrochemical Co., Acheson Graphite Co., and Niagara Electrochemical Co., which take between them about 68,500 h.p. One of the most interesting industries which entirely owes its origin to electrical power is the manufacture of abrasives—carborundum and alundum. There is also the flourishing artificial graphite works. The aluminium works employ about 35,000 h.p., and hold practically the monopoly of the aluminium manufacture in the U.S.A. and Canada. A large part of the power developed from the Niagara is employed for electrochemical purposes on the Canadian side of the falls.

The descriptions of the power obtained from the various falls and rapids is narrated in a very interesting manner. Chapter v. treats of the electric smelting of iron ores and steel production. The electrochemical industries in the Alps, France, and Belgium are also dealt with. In the Alps there are a large number of comparatively small falls, and it says a great deal for the skill of the French engineers that so much use has been made of them, rendering France the chief seat of the electric alloy manufacture. The last chapter describes the electrochemical industries in Great Britain, and anyone reading the book will probably find that there is more work being done in this direction than is generally considered to be the case. The origin of the electrolytic refining of copper was in this country, where it was founded in 1869 by J. Elkington, and the works erected at Pembury, in Wales, are still in operation, although, naturally, they have been enlarged. We congratulate the author upon a very readable and painstaking production.

F. M. P.

NOTES.

We regret to announce the death, on February 13, of Sir George King, K.C.I.E., F.R.S., late director of the Botanical Survey of India, in his sixty-ninth year; also of Prof. Julius Thomsen, president of the Royal Danish Society of Science, at eighty-two years of age.

A Reuter message from Washington states that the Smithsonian Institution has decided to award the first Langley gold medal to Messrs. Wilbur and Orville Wright.

The Berlin Academy of Sciences has awarded the Helmholtz medal to Prof. Emil Fischer, for his work on the sugars and albuminoids.

It is announced that an international exhibition is to be held at Brescia from August to October next under the patronage of the King of Italy.

The Prehistoric Society of France has elected Dr. A. Guebhard president for 1909; MM. Marot and Viré become vice-presidents, Dr. Marcel Baudouin general secretary, and M. L. Giraux treasurer.

The *Petit Journal* recently asked its readers to select by their votes twelve great Frenchmen worthy of being included in the Pantheon. Pasteur's name appeared at the top of the poll with 315,203 votes, and was followed by that of Gambetta with 279,443 votes. We wonder whether a man of science would head the list if a similar plebiscite were taken by a popular daily paper in this country.

The proposed amalgamation of the London Institution with the Society of Arts on the lines of a scheme drawn up by a joint committee in 1905 has been approved by a majority of the proprietors of the former institution. A ballot taken on Monday showed as the result:—for amalgamation, 322; against, 218, the majority in favour thus being 104. The board of management has now to consider whether action shall be taken to carry out the scheme for amalgamation.

The council of the Royal Society of Arts attended at Marlborough House on February 11, when the Prince of Wales, president of the society, presented its Albert medal to Sir James Dewar, F.R.S., "for his investigations into the liquefaction of gases and the properties of matter at low temperatures, investigations which have resulted in the production of the lowest temperatures yet reached, the use of vacuum vessels for thermal isolation, and the application of cooled charcoal to the separation of gaseous mixtures and to the production of high vacua."

At the annual meeting of the Royal Astronomical Society on February 12, the following were elected as the officers and council for the ensuing year:—*President,* Sir David Gill, K.C.B., F.R.S.; *vice-presidents,* Sir W. H. M. Christie, K.C.B., F.R.S., Dr. J. W. L. Glaisher, F.R.S., Mr. H. F. Newall, F.R.S., Prof. H. H. Turner, F.R.S.; *treasurer*, Major E. H. Hills, C.M.G.; *secretaries*, Mr. A. R. Hinks, Mr. S. A. Saunder; *foreign secretary*, Sir William Huggins, K.C.B., O.M., F.R.S.; *council*, Mr. Bryan Cookson, Rev. A. L. Cortie, Mr. A. C. D. Crommelin, Mr. A. S. Eddington, Prof. A. Fowler, Mr. J. A. Hardcastle, Mr. H. P. Hollis, Mr. E. B. Knobel, Mr. T. Lewis, Major P. A. MacMahon, F.R.S., Mr. W. H. Maw, Prof. R. A. Sampson, F.R.S.

Severe earthquake shocks were experienced again at Messina and in Calabria on February 12 and 13. The *Daily Chronicle* Milan correspondent reports the chief shock as occurring on February 13 at 8 p.m., and lasting for ten seconds, the shock being accompanied by noises like that of cannon during a heavy bombardment. A Reuter's message from St. Petersburg states that a slight earthquake shock was felt on February 13, at 8 a.m., at Sotchi, in the Government of Suchum. Another message from Mexico City reports that the volcano of Colima, near the town of that name, was erupting with increasing violence on February 13. Loud subterranean detonations were heard, and showers of hot ashes fell. A stream of

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